PATENT
Attorney Docket No.: 146806

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ching-Pang Lee, et al.	:	
	:	Art Unit: 3745
Serial No.: 10/824,283	:	
	:	Examiner: Wiehe, Nathaniel Edward
Filed: April 14, 2004	:	
	:	
For: METHODS AND APPARATUS FOR REDUCING TURBINE BLADE TEMPERATURES	:	

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL

1. Transmitted herewith is:
   - Amendment Transmittal (3 pages)
   - Amendment After Final (12 pages)

STATUS

2. Applicant
   ☐ claims small entity status.
   ☒ is other than a small entity.

EXTENSION OF TERM

3. The proceedings herein are for a patent application and the provisions of 37 C.F.R. 1.136 apply.

(complete (a) or (b), as applicable)

(a) ____ Applicant petitions for an extension of time under 37 C.F.R. 1.136
(Fees: 37 C.F.R. 1.17(a)-(d) for the total number of months checked below:)

Extension for response within:	Other than small entity Fee	Small entity Fee (if applicable)
____ first month	$ 120.00	$ 60.00
____ second month	$ 450.00	$ 225.00
____ third month	$ 1,020.00	$ 510.00

___	fourth month	$1,590.00	$ 795.00
___	fifth month	$2,160.00	$1,080.00

Fee: $ _____

If an additional extension of time is required, please consider this a petition therefor.

(Check and complete the next item, if applicable)

___ An extension of _____ months has already been secured. The fee paid therefor $_____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request $_____

OR

(b) X Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

FEE FOR CLAIMS

4. The fee for claims (37 C.F.R. 1.16(b)-(d)) has been calculated as shown below:

	(Col. 1) CLAIMS REMAINING AFTER AMENDMENT		(Col. 2) HIGHEST NO. PREVIOUSLY PAID FOR	(Col. 3) PRESENT EXTRA	SMALL ENTITY ADDITIONAL. RATE FEE	OR	OTHER THAN SMALL ENTITY ADDITIONAL RATE FEE
TOTAL INDEP.		MINUS		=	x $25.00 = $		x $50.00 = $
		MINUS		=	x $100.00 = $		x $200.00 = $
___	FIRST PRESENTATION OF MULTIPLE DEP. CLAIM				+ $180.00 = $		+ $360.00 = $
					TOTAL ADDITIONAL FEE $	OR	TOTAL ADDITIONAL FEE $

(a) ☒ No additional fee for Claims is required

OR

(b) ☐ Total additional fee for claims required $ _____

FEE PAYMENT

5. Attached is a check in the sum of $_____

☐ Charge Deposit Account No. 01-2384 the sum of $_____.
A duplicate of this transmittal is attached.

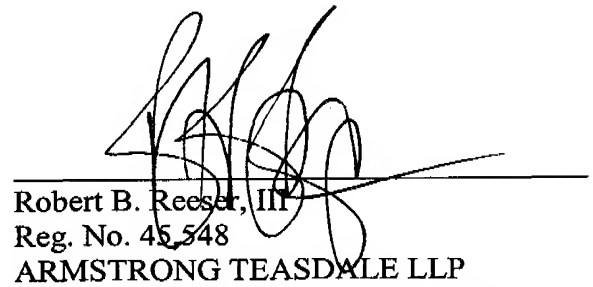
FEE DEFICIENCY

6. ☒ If any additional extension and/or fee is required, charge Deposit Account No. 01-2384.

AND/OR

☒ If any additional fee for claims is required, charge Deposit Account No. 01-2384.

7. ☐ Other:



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AMENDMENT AFTER FINAL

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P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated March 1, 2006, and made final, please amend the above-identified patent application as follows:

IN THE CLAIMS

1. (currently amended) A method of fabricating a rotor blade for a gas turbine engine, wherein the rotor blade includes an airfoil having a first sidewall and a second sidewall connected together at a leading edge and a trailing edge, such that a cavity is formed therebetween, said method comprising:

forming a plurality of rib walls that extend at least partially between the first and second sidewalls, wherein the rib walls define ~~at least one~~ a pressure side cooling circuit and a suction side cooling circuit~~, wherein each cooling circuit includes~~ that each include at least three cooling chambers, wherein a first of the cooling chambers within each circuit supplies cooling fluid to the airfoil cavity; and

forming at least one row of openings within at least one of the rib walls extending between adjacent cooling chambers of each circuit, such that the remaining cooling chambers are coupled in flow communication to the first cooling chamber via the openings~~ and such that at least one of a pressure side circuit and a suction side circuit is formed~~.

2. (canceled)

3. (currently amended) A method in accordance with ~~Claim 2~~ Claim 1 further comprising forming at least one feed chamber, at least one cooling chamber, and an ejection chamber coupled together in flow communication, such that during operation cooling fluid supplied from the feed chamber to the at least one cooling chamber is discharged into the ejection chamber.

4. (original) A method in accordance with Claim 1 further comprising forming a plurality of film cooling holes extending through at least one of the first sidewall and the second sidewall into at least one of the cooling chambers.

5. (original) A method in accordance with Claim 1 further comprising forming a plurality of trailing edge slots extending through at least one of the first sidewall and the second sidewall into at least one of the cooling chambers.

6. (original) A method in accordance with Claim 1 further comprising forming a leading edge circuit including a feed chamber and a cooling chamber coupled together in flow communication by a plurality of openings, such that cooling fluid discharged from the openings is directed towards the airfoil leading edge.

7. (currently amended) An airfoil for a gas turbine engine, said airfoil comprising:

a first sidewall and a second sidewall coupled together at a leading edge and a trailing edge, such that a cavity is defined therebetween;

a plurality of rib walls extending at least partially between said first and second sidewalls, said plurality of rib walls defining ~~at least one~~ a pressure side cooling circuit and a suction side cooling circuit ~~having~~ that each have at least three cooling chambers ~~and comprising a pressure side cooling circuit and a suction side cooling circuit~~; and

at least one row of openings extending through at least one of said rib walls, wherein a first of said cooling chambers of each circuit supplies cooling fluid to said cavity, and said remaining cooling chambers within each circuit are coupled in flow communication with said first cooling chamber via said openings.

8. (canceled)

9. (currently amended) An airfoil in accordance with ~~Claim 8~~ Claim 7 wherein at least one of said pressure side cooling circuit and said suction side cooling circuit comprises at least one feed chamber, at least one transition chamber, and at least one ejection chamber coupled together in flow communication, such that cooling fluid supplied from said at least one feed chamber flows through said at least one transition chamber prior to being discharged into said at least one ejection chamber.

10. (original) An airfoil in accordance with Claim 7 wherein at least one of said first sidewall and said second sidewall comprises a plurality of film cooling holes extending therethrough into at least one of said cooling chambers.

11. (original) An airfoil in accordance with Claim 7 wherein at least one of said first sidewall and said second sidewall comprises a plurality of trailing edge slots extending therethrough into at least one of said cooling chambers.

12. (original) An airfoil in accordance with Claim 7 further comprising a leading edge circuit comprising a feed chamber and a cooling chamber coupled together in flow communication by a plurality of openings, such that cooling fluid discharged from said openings is directed towards said airfoil leading edge.

13. (original) An airfoil in accordance with Claim 7 wherein said plurality of rib walls define at least one purge chamber, the cooling fluid supplied to said cavity transfers heat from said rib walls thereby reducing the temperature of said at least one purge chamber.

14. (currently amended) A gas turbine engine comprising a plurality of rotor blades, each said rotor blade comprising an airfoil comprising a leading edge, a trailing edge, a first sidewall and a second sidewall coupled together at said leading and trailing edges such that a cavity is defined therebetween, a plurality of rib walls extending at least partially between said first and second sidewalls, said plurality of rib walls define at least one purge chamber, and at least one row of openings extending through at least one of said rib walls, wherein said plurality of rib walls define at least one cooling circuit having at least three cooling chambers, wherein a first of said cooling chambers supplies cooling fluid to said cavity, wherein said remaining cooling chambers are coupled in flow communication with said first cooling chamber via said openings, said purge chamber is not actively cooled by cooling fluid supplied to said cavity.

15. (original) A gas turbine engine in accordance with Claim 14 wherein said at least one cooling circuit comprises a pressure side cooling circuit and a suction side cooling circuit.

16. (original) A gas turbine engine in accordance with Claim 15 wherein at least one of said pressure side cooling circuit and said suction side cooling circuit comprises at least one feed chamber, at least one transition chamber, and at least one ejection chamber coupled together in flow communication, such that cooling fluid supplied from said at least one feed chamber flows through said at least one transition chamber prior to being discharged into said at least one ejection chamber.

17. (original) A gas turbine engine in accordance with Claim 14 wherein at least one of said first sidewall and said second sidewall comprises a plurality of film cooling holes extending therethrough into at least one of said cooling chambers.

18. (original) A gas turbine engine in accordance with Claim 14 wherein at least one of said first sidewall and said second sidewall comprises a plurality of trailing edge slots extending therethrough into at least one of said cooling chambers.

19. (original) A gas turbine engine in accordance with Claim 14 further comprising a leading edge circuit comprising a feed chamber and a cooling chamber coupled together in flow communication by a plurality of openings, such that cooling fluid discharged from said openings is directed towards said airfoil leading edge.

20. (previously presented) A gas turbine engine in accordance with Claim 14 wherein the cooling fluid supplied to said cavity transfers heat from said rib walls thereby facilitating reducing the temperature of said at least one purge chamber.

REMARKS

The Office Action mailed March 1, 2006, has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1, 3-7, and 9-20 are now pending in this application. Claims 1-20 stand rejected. Claims 2 and 8 have been canceled.

The objections to Claims 3 and 9 are respectfully traversed. Specifically, Claim 3 has been amended to depend from Claim 1, and Claim 9 has been amended to depend from Claim 7. For at least the reasons set forth above, Applicants respectfully request the objections to Claims 3 and 9 be withdrawn.

The rejection of Claims 1, 3-7, and 9-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,246,340 (Winstanley) in view of U.S. Pat. No. 5,813,835 (Corsmeier) is respectfully traversed.

Winstanley describes an internally-cooled hollow blade (14) for use with a gas turbine engine (10). The blade (14) includes a plurality of ribs (38, 40, 42, 46, 48, and 50) which each extend across the interior of blade (14) between the blade pressure and suction sidewalls (22 and 24, respectively). The ribs (38, 40, 42, 46, 48, and 50) define a plurality of internal cavities (52, 54, 56, 58, 60, 62, 64, and 66) that extend chord-wise from a leading edge (18) to a trailing edge (20) of blade (14). A plurality of passages (39, 41S, 41P, 43P, 43S, 45, 47, 49, and 51) extend through the ribs (38, 40, 42, 46, 48, and 50) to facilitate delivery of cooling air flow to adjacent cavities (52, 54, 56, 58, 60, 62, 64, and 66) in a general chordwise flow direction. The blade (14) includes a plurality of exhaust apertures (68, 70, and 72) which exhaust spent cooling air from the interior cavities (52, 54, 56, 58, 60, 62, 64, and 66) to the exterior of the blade. Notably, Winstanley does not describe nor suggest defining a pressure side and a suction side cooling circuit, but rather describe a plurality of internal cavities that extend within the interior of the blade from the pressure side of the blade to the suction side of the blade and that are spaced chordwise from the leading edge to the trailing edge of the blade.

Corsmeier describes an internally-cooled turbine blade (16) that includes a concave sidewall (18) and a convex sidewall (20). The blade (16) also includes a pair of serpentine side cooling passages (22 and 24), a middle cooling passage (26), a trailing edge cooling passage (30), and a leading edge cooling passage (28). Air is admitted to blade (10) through its root (12) and is channeled to various cooling passages (22, 24, 26, 28, and 30). Air entering passage (22) exits blade (10) through an orifice (52) and facilitates cooling concave side (18). Air within cooling passage (28) is ejected through film cooling holes (29) to facilitate cooling leading edge (17). Air within trailing edge cooling passage (30) is ejected across a trailing edge (19) of blade (10). Notably, Corsmeier does not describe nor suggest a purge chamber that is not actively cooled by cooling fluid supplied to the cooling passages. Moreover, Corsmeier does not describe nor suggest defining at least one row of openings within at least one of the rib walls extending between adjacent cooling chambers, but rather describes the formation of distinct passages wherein cooling air flow is not in fluid communication with other passages.

Applicants respectfully submit that the Section 103 rejection of presently pending claims is not a proper rejection. Obviousness cannot be established by merely suggesting that it would have been an obvious to one of ordinary skill in the art to combine Corsmeier with Winstanley. More specifically, it is respectfully submitted that a prima facie case of obviousness has not been established. As explained by the Federal Circuit, "to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the Applicant." In re Kotzab, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000). MPEP 2143.01.

Moreover, as is well established, the mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. See In re Gordon, 221 U.S.P.Q.2d 1125 (Fed. Cir. 1984). Furthermore, the Federal Circuit has determined that:

> [i]t is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that "[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

In re Fitch, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). Further, under Section 103, "it is impermissible . . . to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In re Wesslau, 147 USPQ 391, 393 (CCPA 1965). Rather, there must be some suggestion, outside of Applicant's disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicant's disclosure. In re Vaeck, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the cited art, nor any reasonable expectation of success has been shown.

Accordingly, since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicant requests that the Section 103 rejection of Claims 1, 3-7, and 9-20 be withdrawn.

Moreover, if art "teaches away" from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams, 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard, it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention. Specifically, Applicants respectfully submit that Corsmeier teaches away from the present invention and from Winstanley, and as such, thus supports the nonobviousness of the present invention. More specifically, in contrast to the present invention and to Winstanley, Corsmeier clearly describes an airfoil including solid ribs that do not include any openings formed therein that enable adjacent cooling chambers separated by the ribs to be coupled together in flow communication. Rather, Corsmeier describes the use of distinct passages such that cooling air flowing in cooling chambers is not in fluid communication with any adjacent cooling chambers.

In addition, no combination of Winstanley and Corsmeier describes or suggests the claimed invention. Specifically, Claim 1 recites a method of fabricating a rotor blade for a gas turbine engine, wherein the rotor blade includes an airfoil having a first sidewall and a second sidewall connected together at a leading edge and a trailing edge, such that a cavity is

formed therebetween, wherein the method comprises "forming a plurality of rib walls that extend at least partially between the first and second sidewalls, wherein the rib walls define a pressure side cooling circuit and a suction side cooling circuit that each include at least three cooling chambers, wherein a first of the cooling chambers within each circuit supplies cooling fluid to the airfoil cavity . . . and forming at least one row of openings within at least one of the rib walls extending between adjacent cooling chambers of each circuit, such that the remaining cooling chambers are coupled in flow communication to the first cooling chamber via the openings."

No combination of Winstanley and Corsmeier describes nor suggests a method of fabricating a rotor blade for a gas turbine engine as is recited in Claim 1. Specifically, no combination of Winstanley and Corsmeier describes nor suggests forming a plurality of rib walls that extend at least partially between the first and second sidewalls, wherein the rib walls define a pressure side cooling circuit and a suction side cooling circuit that each include at least three cooling chambers in combination with forming at least one row of openings within at least one of the rib walls extending between adjacent cooling chambers of each circuit. Rather, in contrast to the present invention, Winstanley describes a blade including a plurality of chordwise-spaced cavities that extend from the pressure-side of the blade to the suction-side of the blade and that are coupled serially together in flow communication through mid-chord passages, and Corsmeier describes an airfoil which includes a plurality of rib walls that extend between adjacent chambers, but does not describe nor suggest any openings within any rib walls to coupled the chambers together in flow communication. As such, no combination of Winstanley and Corsmeier describes or suggests forming a plurality of rib walls that extend at least partially between the first and second sidewalls, wherein the rib walls define a pressure side cooling circuit and a suction side cooling circuit that each include at least three cooling chambers in combination with forming at least one row of openings within at least one of the rib walls extending between adjacent cooling chambers of each circuit. Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Winstanley in view of Corsmeier.

Claims 3-6 depend from independent Claim 1. When the recitations of Claims 3-6 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 3-6 likewise are patentable over Winstanley in view of Corsmeier.

Claim 7 recites an airfoil for a gas turbine engine, wherein the airfoil comprises "a first sidewall and a second sidewall coupled together at a leading edge and a trailing edge, such that a cavity is defined therebetween . . . a plurality of rib walls extending at least partially between said first and second sidewalls, said plurality of rib walls defining a pressure side cooling circuit and a suction side cooling circuit that each have at least three cooling chambers . . . at least one row of openings extending through at least one of said rib walls, wherein a first of said cooling chambers of each circuit supplies cooling fluid to said cavity, and said remaining cooling chambers within each circuit are coupled in flow communication with said first cooling chamber via said openings."

No combination of Winstanley and Corsmeier describes nor suggests an airfoil for a gas turbine engine as is recited in Claim 7. Specifically, no combination of Winstanley and Corsmeier describes nor suggests a plurality of rib walls extending at least partially between said first and second sidewalls wherein the plurality of rib walls define a pressure side cooling circuit and a suction side cooling circuit that each have at least three cooling chambers, in combination with at least one row of openings extending through at least one rib wall such that a first of the cooling chambers is coupled in flow communication with the remaining cooling chamber via the openings. Rather, in contrast to the present invention, Winstanley describes a blade that includes a plurality of chordwise spaced cavities that extend between the pressure and suction sides of the blade and that are coupled serially together in flow communication through mid-chord passages, and Corsmeier describes an airfoil which includes a plurality of solid ribs that extend across the airfoil, none of which includes any openings that couple adjacent cooling chambers together in flow. Accordingly, for at least the reasons set forth above, Claim 7 is submitted to be patentable over Winstanley in view of Corsmeier.

Claims 9 -13 depend from independent Claim 7. When the recitations of Claims 9-13 are considered in combination with the recitations of Claim 7, Applicants submit that dependent Claims 9-13 likewise are patentable over Winstanley in view of Corsmeier.

Claim 14 recites a gas turbine engine comprising "a plurality of rotor blades, each said rotor blade comprising an airfoil comprising a leading edge, a trailing edge, a first sidewall and a second sidewall coupled together at said leading and trailing edges such that a cavity is defined therebetween, a plurality of rib walls extending at least partially between

said first and second sidewalls, said plurality of rib walls define at least one purge chamber . . . at least one row of openings extending through at least one of said rib walls . . . said plurality of rib walls define at least one cooling circuit having at least three cooling chambers . . . said remaining cooling chambers are coupled in flow communication with said first cooling chamber via said openings . . . said purge chamber is not actively cooled by cooling fluid supplied to said cavity."

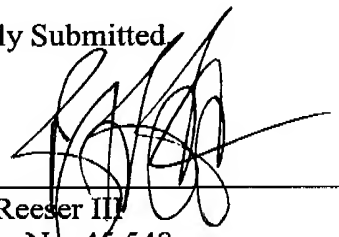
No combination of Winstanley and Corsmeier describes nor suggests a gas turbine engine as is recited in Claim 14. Specifically, no combination of Winstanley and Corsmeier describes nor suggests a plurality of rib walls extending at least partially between said first and second sidewalls wherein the plurality of rib walls define at least one cooling circuit having at least three cooling chambers, wherein at least one rib wall includes at least one row of openings that couple the cooling chambers together in flow communication. Rather, in contrast to the present invention, Winstanley describes a blade that includes a plurality of chordwise spaced cavities that extend between the pressure and suction sides of the blade and that are coupled serially together in flow communication through mid-chord passages, and Corsmeier describes an airfoil which includes a plurality of solid ribs that extend across the airfoil, none of which includes any openings that couple adjacent cooling chambers together in flow. Moreover, no combination of Winstanley and Corsmeier describes nor suggests a rib wall that defines a purge chamber that is not actively cooled by cooling fluid supplied to said cavity. Accordingly, for at least the reasons set forth above, Claim 14 is submitted to be patentable over Winstanley in view of Corsmeier.

Claims 15-20 depend from independent Claim 14. When the recitations of Claims 15-20 are considered in combination with the recitations of Claim 14, Applicants submit that dependent Claims 15-20 likewise are patentable over Winstanley in view of Corsmeier.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 1, 3-7, and 9-20 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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